Panel Session 4.2 Questions and Answers

Introduction by Norman T. Holcombe: At this time, I will ask all the panelists to assemble up here at the front table. I will open the panel discussion to the floor for questions — to me, Larry Golan, or for questions directed to specific panelists.

Question: What workshops are being planned?

Response: Larry mentioned that. Two being planned are Combustion Workshop V in March 1998 and Heat Transfer Workshop III, being organized by the University of Texas at Austin, that's either going to be in the Fall of 1998 or the Spring of 1999. And we are considering a specialty workshop on thermal barrier coatings (TBCs), platinum aluminide bond coats with professor Woo Lee at Stevens Institute along with NASA and Ian Wright at Oak Ridge National Laboratory, which will probably be in the Spring of 1998. Those are the three that are planned.

This is a good time for the university people to express their concerns or criticisms or comments.

Comment: I want to compliment the efforts of this panel. The AGTSR is probably one of the more successful programs as illustrated by the high level of cooperation. I think it would be valuable to realize the message from this cooperation between industry and universities. One thing I think we have realized, is that university manpower has helped you develop the industrial products, and the manpower is used and trained by the universities. You have a lot of students who are spending their summers working in industry. What is needed is to have the industrial fellows come to the universities and participate in the teaching aspect. That is something in which industry has not taken an active role.

The other comment I have is that there are a lot of workshops in combustion and heat transfer, but none in aerodynamics. That does not mean that there are no unresolved aerodynamics problems.

Comment: As you know, Allison did have representative courses at Penn State and other universities. So we have been involved in that role, but not on a long-term basis.

Comment: A turbine designer and mentor said that any fool could design a turbine but a compressor is very difficult. I think that compressors are not that very difficult to design even though the aerodynamics are important to ATS. The main issues are the single digit NO_X, which is a combustion issue, and the durability of TBCs, which is a materials problem. So these two areas are most important. You are right. Aerodynamics is extremely important to get the high efficiency.

Comment: I would like to follow up on the previous remark on the separation of industry research from university work from another aspect. For a program on such a large scale

as ATS, industries find themselves working on projects to meet their specific needs. What I would suggest for AGTSR proposals, in order to find solutions to ATS problems, would be to get an experienced engineer to work at an industry with a salary that the university could offer. Then, think of something specific to fit the research needs of the company related to the turbines of this company. What I would like to suggest is that a company would consider a specific project. Then, engineers from that company would be designated to work on the project and the university would pay a portion of the engineer's salary and the company would pay the rest. That would be a true indicator of a firm industry-university collaboration.

However, be aware that there can be some proprietary problems where the company would be likely to disclose details of a proprietary process or project to university people. The companies encounter problems in the research, and the university people who are working on their regular research cannot then work with other companies who may also have similar problems. This is something that needs to be thought about.

Question: Interesting point. Dennis, do you have any comments on industrial intentions of going to a university lab and sharing the cost of the research?

Answer: I think in concept, it is an excellent idea. I think that the interaction is beneficial, however it takes place. One of the lessons university researchers get from this is some appreciation for what our quality infrastructural issues can be. Commonality of understanding is very important. As far as the proprietary issues discussed go, perhaps this would not be a problem if we are working on, as Bill Day suggested, noncompetitive, noncontroversial ATS projects. So these things would just have to be worked out in the terms and the conditions of the agreement, but I guess this is a little like jury duty. The arrangement means one thing to the company and another to the individual.

I think that this is probably a really good idea. I think the real issue, however, is peeling off the right person at the right time who is knowledgeable and expendable. Quite frankly in terms of a company's resources, such a person may be singular and scarce. And the company has to be working on something that is a little longer range so that it has the flexibility to excuse the researcher, if you will, from current duties.

Comment: Two comments and a question while I am up here. I am from Brigham Young University. First, I must say how impressed I am with the overall AGTSR program. We've been involved in ATS research since its early days, and I have been involved with DOE research for two or three decades. To see this very close government, industry, and university cooperation to me is extremely impressive. I really appreciate it and I hope we have the privilege of participating.

Comment: Now, a comment relating to the format of the meeting. I find the poster sessions very stimulating and yet I see two problems with that. One is that over a 90-minute period, I was busy the whole time. I also saw that probably only 10 percent of the audience was in attendance. Also, I didn't get a chance to see all the posters. What is happening at the universities? I see those two weaknesses, and I am wondering if I understand. There is probably

some rationale for not having a technical session on the very fundamental research being talked about here. I wonder if it would not be possible to have even parts of sessions on the projects that are nearing completion. Their results are very substantial. They could have 10-minute periods to present just a few of those at the very end of the sessions so that the whole audience starts to see what's happening at the universities. For example, we keep hearing about this issue of the challenge of the premixed, low $NO_{X,}$ single-digit systems. We cannot predict that with a fully functional code. We would like to be able to share that in more detail than seeing less than 10 percent of the audience in a poster session. I would like to see the other posters too. Of course, some would have no opportunity to do that.

Question: The last point is a question for you, and I would welcome comments on this from Dan or whomever. What is the status of the current round of proposals and the timing and forecast or prediction of the budget availability?

Answer: We do have technical workshops on the combustion projects. I don't know if there is a place in this review meeting to have the detailed presentations you are alluding to. We can bring that up with Abbie Layne and Norm Holcombe for the next year I guess.

I really did not want to get into the status of new awards, but I can tell you that the process will be similar to last year. We are trying to organize the new RFP and will probably release that in the spring. As far as the awards that were selected by the IRB in the last round, those are projected to get started in early next year. As Larry pointed out, that's about all I can say right now. I can talk to you about individual cases afterwards.

Any other questions from the university people, industry people out there. Yes sir.

Question: I am from Saudi Arabia. Two comments: first, on the poster session. I think the poster session has given me a lot of insight on where some of our engineers can come over and do graduate work. A lot of these projects can give them ideas on what kind of work they can do and bring back home to us. The second comment is on the student intern program. You have been talking summer student co-op programs and so forth. We have a program where we send graduate students to companies in the U.S. to spend a year to get some of the experience they cannot get in Saudi Arabia because we do not have the manufacturing base. I would like to hear from the panel on what their companies think about this.

Comment: I appreciate the comments, but the AGTSR program is a U.S. gas turbine consortium for U.S. companies only. Do Abbie or Norman have any comments on this suggestion?

Abbie: We will try to think about it, but the AGTSR is just a U.S. gas turbine consortium at this stage. All I am saying is that for the most part, I can see tremendous technology transfer coming from the program, and especially with the AGTSR consortium. Our constraint is that these are U.S. gas turbine manufacturers. And so, therefore, technology transfer may go from the hardware being developed by the manufacturers to products sold overseas. And that's the form of technology transfer for us for now.

Comment: I have listened to presentations on the simplest component devices. All the participants from across the Atlantic would like to see, for example, heat transfer and combustion as a more global workshop.

Comment: We did propose that in the beginning of the consortium. Industry decided that they wanted to focus just on components and not on the system housing. But as far as multi-disciplinary research goes, we are encouraging the systems point of view in proposals. You made a good point that our workshops are on separate, discrete topics: combustion is separate, and heat transfer is separate. We try to keep them informal, to no more than 50 to 70 people, and strictly on a technical level, not with a programmatic emphasis.

Question: Is it possible to have professors in other disciplines attend the combustion workshops or not?

Response: You are invited to attend workshops if you are a professor of aerodynamics, materials, or heat transfer. It just turns out that the people who participate in these workshops are combustion experts. We do have some professors who attend some combustion workshops, although they have funding for heat transfer research.

Comment: I am Harold Stocker from Cinergy. I think your stool has a missing leg. I spent 30 years in the gas turbine industry. I chased R&D budgets, managed R&D programs, have written my share of papers, and have given my share of presentations. I know that side of the house pretty well. For the last 5 years, I have been on the user side. I think user concerns are missing here. Take yourself: you buy an automobile. You expect that automobile to do certain things for certain amounts of time. And when it doesn't, you are very disappointed, very frustrated. When you go back to talk to the salesman, you don't get a lot of sympathy. There is some of that same thinking in the gas turbine industry.

I would encourage you to take a look at your group and think seriously about adding a few users to your group. Some of the things that we users are concerned about you have heard and you acknowledge. However, I am not sure you get a good feel for many user concerns, such as repairability. For example, I know that the gas turbine industry makes a lots of money on replacement parts. We, on the user side, lose lots of money on replacement parts that we did not expect to need. So I think that in your university/industry consortium, an important element ought to be to get both university students as well as industry a little closer to what is going on now in the field. And understand those problems. When you go into advanced technology, don't forget the user, because he is the ultimate payer. If he is not successful in his business because he cannot afford your product, you are not going to have a whole lot of customers left.

Response: Thank you for that thought. I do agree with you, that is a missing leg. We have tried to get users on our industry board. Maybe that will change in the future. Some of the users basically tell us that they are users and are not really interested. They say that's more for the OEMs and the long-term R&D. That's their comeback. Maybe if they were on our board, some of those issues could be incorporated. That's the best answer I can give you right now.

Comment: I have heard talks about combined cycle systems, and I figured that this subject was really interesting. If I am understanding the benefits of a combined cycle correctly, I can do something with the combustor to avoid the need for extremely specialized materials in the turbines. Yesterday I heard a presentation on the idea of a combined cycle. On the other hand, an industry speaker said in essence, "Look, there is no more of them. These turbines are simple and they were supposed to be simple. And the combined cycle is complicating them."

Comment: I just wanted to comment about systems and system enclosure. It is not only the engine in the system, but as Charlie Cook has pointed out, the cycle is part of the system. The overall plant is part of the system. Fuel processing, such as coal and natural gas, are all part of the system. I would hope that universities have part of the responsibility for the general training of students in systems.

Question: I would like to hear from some of the university professors. Do you think that the collaborations are benefitting your research?

Response: I would like to comment to say they are very beneficial. I am one of the lucky recipients of funding from another agency in combustion. The number of proposals submitted was 33 and they funded one. This agency had 22 submitted to them, and they were able to fund three. So I add those up and I get 55 total combustion proposals and funding of four. Thank you.

Comment: That is a good point. That is a question we can ask right now. We have three research topics. The topics are supposed to change every year, but this year it was combustion, heat transfer, and some research on thermal barrier coatings. But the question you are implying is, should we focus the RFP? I mean, if we are only funding 7 percent or less than 10 percent of the combustion proposals, should we only have a single technology area that we key on?

Comment: I would like to keep it the way it is.

Comment: I agree. We only have so much money. Use it as we have been.

It is close to break. I appreciate your participation and DOE's participation. Thank you.